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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/527,183	11/14/2005	Oliver Stoll	10191/4040	9980

26646 7590 11/21/2007

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EXAMINER	
ANGWIN, DAVID PATRICK	
ART UNIT	PAPER NUMBER
4155	
MAIL DATE	DELIVERY MODE
11/21/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/527,183	STOLL ET AL.	
	Examiner	Art Unit	
	David P. Angwin	4155	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *3/7/05*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *15-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *15-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 March 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *3/7/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Priority

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No. 2004-347049, filed on November 30, 2004.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on 6/28/07 is being considered by the examiner.

Claim Rejections – 35 USC § 103

The following is a quotation of 35 U.S.C. § 103(a) that forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically taught or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. § 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 15 is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Ueyanagi et al* (US Patent 6,332,359 B1) in view of *Susukida et al* (US Patent 6,407,764 B1), *Bonin et al* (US Patent 6,387,778 B1), and *Ishii et al* (US Patent 5,919,713).

a. *Ueyanagi et al* teaches the following in his reference:

i. providing a sensor element having at least one sensitive region that is sensitive with respect to one of strain and compression (4:65-5:3; Figs. 11a, 11b, 11c, 12, 13a, and 13b, item 300);

ii. connecting a plurality of electrical structures to the sensor element (Figs. 11a, 11b, 11c, 12, 13a, and 13b, item 304);

iii. providing a substrate (Figs. 14a-14h, item 100);

~~iv. producing an activatable layer on top of a sacrificial layer;~~

v. producing the at least one sensitive region one of on and within the activatable layer (Figs. 14a-14h, 16a, 16b, and 16c, items 300, 403, and 100);

~~vi. producing the sacrificial layer one of on and within the substrate;~~

vii. producing the at least one sensitive region and at least a portion of the electrical structures one of on and within the activatable layer (Fig. 16c, items 300 and 106);

viii. ~~producing a circumferential trench that is interrupted by at least one connecting point connecting the at least one sensitive region of the sensor element to a portion of the activatable layer that lies outside the circumferential trench, the circumferential trench being produced around the at least one sensitive region of the sensor element;~~

ix. ~~removing the sacrificial layer;~~

x. ~~fixating the at least one sensitive region by a holding device;~~

xi. ~~rupturing the at least one connecting points;~~

xii. ~~performing a transfer of the sensor element, fixated by the holding device; and~~

xiii. ~~connecting the sensor element to a carrier~~.

b. *Ueyanagi et al* does not expressly teach the following in his reference:

i. ~~providing a sensor element having at least one sensitive region that is sensitive with respect to one of strain and compression (4:65-5:3; Figs. 11a, 11b, 11c, 12, 13a, and 13b, item 300);~~

ii. ~~connecting a plurality of electrical structures to the sensor element (Figs. 11a, 11b, 11c, 12, 13a, and 13b, item 304);~~

iii. ~~providing a substrate (Figs. 14a-14h, item 100);~~

iv. producing an activatable layer on top of a sacrificial layer;

v. ~~producing the at least one sensitive region one of on and within the activatable layer (Figs. 14a-14h, 16a, 16b, and 16c, items 300, 403, and 100);~~

vi. producing the sacrificial layer one of on and within the substrate;

vii. ~~producing the at least one sensitive region and at least a portion of the electrical structures one of on and within the activatable layer (Fig. 16c, items 300 and 106);~~

viii. producing a circumferential trench that is interrupted by at least one connecting point connecting the at least one sensitive region of the sensor element to a portion of the activatable layer that lies outside the circumferential trench, the circumferential trench being produced around the at least one sensitive region of the sensor element;

ix. removing the sacrificial layer;

x. fixating the at least one sensitive region by a holding device;

xi. rupturing the at least one connecting points;

xii. performing a transfer of the sensor element, fixated by the holding device; and

xiii. connecting the sensor element to a carrier.

d. However, *Susukida et al* teaches the following in his reference:

i. producing an activatable layer on top of a sacrificial layer (Figs. 42a-42f, items 50, 53, 52a, and 52b; 21:50-64);

ii. producing the sacrificial layer one of on and within the substrate (Figs. 42a-42f, items 71 and 70; 21:25-30); and

iii. removing the sacrificial layer (23:35-56).

- The advantage of utilizing an activation layer above a sacrificial layer is to eventually remove the sacrificial layer to easily remove a sensor element.
- Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify:

1. an activation layer without a sacrificial layer below it as taught by *Ueyanagi et al*; with

2. an activation layer with a sacrificial layer below it as taught by *Susukida et al*;

to remove the sacrificial layer to easily remove a sensor element atop the activation layer.

c. In addition, *Bonin et al* teaches the following in his reference:

i. producing a circumferential trench that is interrupted by at least one connecting point connecting the at least one sensitive region of the sensor element to a portion of the activatable layer that lies outside the circumferential trench, the circumferential trench being produced around the at least one sensitive region of the sensor element (1:66-2:10; Figures 7a and 7b, items 80, 82, and 90).

- The advantage of producing a trench around a sensitive region is to eventually remove the electrical device comprising the sensitive region through a fabrication process and allow the electrical device to remain in place.
- Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify:
    1. a sensor without a circumferential trench and a connecting point as taught by *Ueyanagi et al*; with
    2. a sensor with a circumferential trench and a connecting point as taught by *Bonin et al*;

to eventually remove the electrical device comprising the sensitive region through a fabrication process and allow the electrical device to remain in place.

d. Finally, *Ishii et al* teaches the following in his reference:

    i. fixating the at least one sensitive region by a holding device (3:34-44, "sticky medium"; 6:53-57);

    ii. rupturing the at least one connecting points (2:55-57; 3:34-38; 6:58-62);

    iii. performing a transfer of the sensor element, fixated by the holding device (3:4-12; 7:3-6); and

    iv. connecting the sensor element to a carrier (3:7-12; 7:3-6).

e. The advantage of fixating the sensitive region, rupturing the connecting point, and connecting the sensitive region to a carrier is to secure, safely

transport, and deliver an electrical component to a desired location after it has been separated from a wafer.

f. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify:

1. a process that does not expressly include the steps of fixating to the sensitive region, rupturing the connecting point, and connecting the sensitive region to a carrier as taught by *Ueyanagi et al*; with

2. a process that does expressly include the steps of fixating to the sensitive region, rupturing the connecting point, and connecting the sensitive region to a carrier as taught by *Ishii et al*;

to secure, safely transport, and deliver an electrical component to a desired location after it has been separated from a wafer.

Regarding **claim 16**:

a. In addition to the limitations taught by *Ueyanagi et al* as modified by Susukida *et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15, *Ueyanagi et al* further teaches the following in his reference:

i. the component includes a strain gauge (4:65-5:3).

b. The examiner notes that a strain gauge is considered a deformation sensor.

Regarding **claim 17**:

a. In addition to the limitations taught by *Ueyanagi et al* as modified by Susukida *et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15, *Ueyanagi et al* further teaches the following in his reference:

   i. the sacrificial layer includes a layer of silicon oxide (Figs. 25A-25D, item 601) provided on the substrate (item 600), the substrate includes silicon (item 600; 19:61-67), and the activation layer includes a layer of monocrystalline silicon (19:61-67).

b. The examiner notes that "single crystal Si" mentioned in the reference is considered monocrystalline silicon.

Regarding **claim 18**:

a. In addition to the limitations taught by *Ueyanagi et al* as modified by Susukida *et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15, *Ueyanagi et al* further teaches the following in his reference:

   i. producing the at least one sensitive region as one of a strain gauge resistor (20:26-30; Fig. 25C, items 601, 603, 613a, 613b, 613c, and 613d) in a region of a top side of a surface of the activatable region, the at least one sensitive region having a thickness of 5 micrometers thickness (19:61-67).

Regarding **claim 19**:

a. In addition to the limitations taught by *Ueyanagi et al* as modified by Susukida *et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15, *Ueyanagi et al* further teaches the following in his reference:

   i. producing the at least one sensitive region by regional doping of the activatable layer, the regional doping including one of ion implantation and in-diffusion of foreign atoms (20:26-30).

Regarding **claim 20**:

a. In addition to the limitations taught by *Ueyanagi et al* as modified by Susukida *et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15, *Ueyanagi et al* further teaches the following in his reference:

   i. producing a contact region (Figs. 16C and 19, depicted as square terminal pads) in a vicinity of the at least one sensitive region, the contact region including a superficial metal coating by which the at the least one sensitive region is electrically contactable.

b. The examiner notes that terminal pads are known in the art to have a metal coating to facilitate electrical conduction.

Regarding **claim 21**:

a. In addition to the limitations taught by *Ueyanagi et al* as modified by Susukida *et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15, *Bonin et al* further teaches the following in his reference:

   i. forming the at least one connecting point as a setpoint rupture joint (Figs. 7a and 7b, item 80); and

   ii. adjusting a mechanical stability of the at least one connecting point corresponding to the setpoint rupture joint via a form of the at least one connecting point in a plan view (Figs. 7a and 7b, items 80, 82, and 90).

b. The advantage of forming and adjusting the one connecting point is to maintain contact with the sensitive region and control when the sensitive region separates from the wafer.

c. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to replace:

1. a process that does not expressly include the steps of forming at least one connecting point and adjusting the mechanical stability of the connecting point as taught by *Ueyanagi et al* as modified by Susukida *et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15; with

2. a process that does include the steps of forming at least one connecting point and adjusting the mechanical stability of the connecting point as taught by *Bonin et al*.

to maintain contact with the sensitive region and control when the sensitive region separates from the wafer.

Regarding **claim 22**:

a. In addition to the limitations taught by *Ueyanagi et al* as modified by Susukida *et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15, *Bonin et al* further teaches the following in his reference:

i. producing a circumferential trench in a trench process that includes an anisotropic plasma etching process (4:21-26), in such a way that the circumferential trench reaches from a surface of the activatable layer down to the sacrificial layer in depth .

b. The advantage of producing a circumferential trench by anisotropic plasma etching is to remove material through a well known process.

c. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to replace:

1. a material removal process that does not expressly teach producing a circumferential trench through anisotropic plasma etching as taught by *Ueyanagi et al* as modified by

Susukida *et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15; with

2. a material removal process that does not expressly teach producing a circumferential trench through anisotropic plasma etching as taught by *Bonin et al;*

to remove material through a well known process.

Regarding **claim 23**:

a. In addition to the limitations taught by *Ueyanagi et al* as modified by *Susukida et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15, *Ueyanagi et al, Susukida et al,* and *Bonin et al* further teach the following in their references:

i. following the production of the circumferential trench, removing the sacrificial layer below the sensor element by etching (*Susukida et al*, 23:36-40) ~~including vapor-phase etching with HF vapor~~ in such a way that the sensor element is held above a cavity (*Ueyanagi et al*, Figs. 22-23, items 603 and 602) in a self-supporting manner by the at least one connecting point (*Bonin et al*, Figs. 7a and 7b, items 80 and 90).

b. The advantage of removing the sacrificial layer below the sensor element whereby the sensor element is held above the cavity is to easily remove the sensor element when desired.

c. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to replace:

1. a process that does <u>not</u> expressly teach removing a sacrificial layer as taught by *Ueyanagi et al* as modified by Susukida *et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15; with

2. a process that does teach removing a sacrificial layer as taught by *Ueyanagi et al*, *Susukida et al*, and *Bonin et al*;

to easily remove the sensor element when desired.

d. The examiner also notes that although *Susukida et al* does not expressly teach utilizing vapor phase etching with HF vapor, it does teach utilizing an etching process. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use vapor phase etching with HF vapor. Since the examiner takes Official Notice of the equivalence of etching and vapor phase etching with HF vapor for their use in producing semiconductor wafer chips, then either of these known equivalents would be within the level of ordinary skill in the art at the time the invention was made.

Regarding **claim 24**:

a. In addition to the limitations taught by *Ueyanagi et al* as modified by *Susukida et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15, *Ueyanagi et al* further teaches the following in his reference:

i. producing the at least one sensitive region with a plurality of strain gauge resistors (20:26-30; Fig. 25C, items 601, 603, 613a, 613b, 613c, and 613d), the plurality of strain gauge resistors being interconnected via the plurality of electrical structures (Fig. 6) to form one of a Wheatstone bridge circuit and a half-bridge of a Wheatsone bridge circuit (1:34-36; Figs. 1A and 1B, items 4a, 4b, and 4c; Figs. 2A and 9).

Regarding **claim 25**:

a. In addition to the limitations taught by *Ueyanagi et al* as modified by *Susukida et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15, *Ueyanagi et al* further teaches the following in his reference:

i. producing contact surfaces on one of the activatable layer and the at least one sensitive region (Figs. 16C and 19, item 106, square terminal pads).

Regarding **claim 28**:

a. In addition to the limitations taught by *Ueyanagi et al* as modified by *Susukida et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15, *Ueyanagi et al* further teaches the following in his reference:

i. a plurality of sensor elements is produced simultaneously on the substrate, and the sensor elements are fixated by the holding device individually one after another (3:34-44, "sticky medium"; 6:53-57), transferred (3:4-12; 7:3-6) after rupturing of the at least one connecting point (2:55-57; 3:34-38; 6:58-62), and connected to the carrier (3:7-12; 7:3-6).

Regarding **claim 29**:

a. In addition to the limitations taught by *Ueyanagi et al* as modified by *Susukida et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15, *Ueyanagi et al* further teaches the following in his reference:

i. the ruptured sensor elements are adjusted relative to the carrier individually assigned thereto and are mounted thereon, in a continuous operation (3:4-12; 7:3-6; 3:7-12; 7:3-6).

Claim 27 is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Ueyanagi et al* (US Patent 6,332,359 B1) as modified by *Susukida et al* (US Patent

6,407,764 B1), *Bonin et al* (US Patent 6,387,778 B1), and *Ishii et al* (US Patent 5,919,713) as applied to claim 15 in further view of *Kim et al* (US Patent 5,296,741).

a. *Ueyanagi et al* as modified by *Susukida et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15 do not expressly teach the following in their references:

   i. joining the sensor element to the carrier at least partially via one of a membrane region and a deformation region of the carrier, the carrier including a steel substrate.

b. However, *Kim et al* teaches the following in his reference:

   i. joining the sensor element to the carrier at least partially via one of a membrane region and a deformation region of the carrier, the carrier including a steel substrate (Figs. 3-6B).

c. The examiner notes that even though *Kim et al* does not expressly teach a carrier made of a steel substrate, a steel substrate is well known in the art. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize a steel substrate, since it has been held to be within the general skill of a worker in the art to select a known material on this basis of its suitability for the intended use as a matter of obvious design choice.

d. The advantage of joining the sensor element to the carrier via a membrane region or a deformation region is that those two locations are easy to grasp because they contain the most area of the chip.

e. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify:

1. a process that does not expressly include joining the sensor element to the chip in the manner specified; with

2. a process that does include joining the sensor element to the carrier via a membrane region or a deformation region as taught by *Kim et al*;

to easily grasp an area of the chip with the most available space.

Claim 26 is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Ueyanagi et al* (US Patent 6,332,359 B1) as modified by *Susukida et al* (US Patent 6,407,764 B1), *Bonin et al* (US Patent 6,387,778 B1), and *Ishii et al* (US Patent 5,919,713) as applied to claim 15 in further view of *Kim et al* (US Patent 5,296,741) and *Lin et al* (US Patent 6,341,769).

a. *Ueyanagi et al* as modified by *Susukida et al*, *Bonin et al*, and *Ishii et al* as applied to claim 15 do not expressly teach the following in their references:

i. rupturing of the at least one connecting point is implemented with the aid of a vacuum gripper that grabs the sensor element to be detached, and wherein the substrate is fixated during the rupturing by a holding device corresponding to an electrostatic clamping device.

b. However, *Kim et al* and *Lin et al* further teach the following in their references:

i. rupturing of the at least one connecting point is implemented with the aid of a vacuum gripper (*Kim et al*, 1:29-32) that grabs the sensor element to be detached, and wherein the substrate is

fixated during the rupturing by a holding device corresponding to an electrostatic clamping device (*Lin et al*, 1:4-7; 1:14-23).

d. The advantage of utilizing a vacuum gripper and a clamping device is to effectively hold both the chip and the wafer during rupturing.

e. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify:

1. a rupturing process that does not expressly include utilizing a vacuum gripper and a clamping device; with

2. a rupturing process that does include utilizing a vacuum gripper and a clamping device as taught by *Kim et al* and *Lin et al*;

to effectively hold both the chip and the wafer during rupturing.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David P. Angwin whose telephone number is 703-270-3735. The examiner can normally be reached on 7:30 AM - 5 PM (M-F).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Victor Batson can be reached on 703-272-6987. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Victor Batson/

Victor Batson
Supervisory Patent Examiner
Art Unit 4155

DPA